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in which eyes necessarily enter, must have originally had them. And, since one finds among them species which are deprived of these organs, and which have only traces, hidden and covered, it becomes evident that the impoverishment and even the disappearance of the organ in question is the result of constant disuse.

[To be continued.]

ON THE GLACIAL DRIFT AND LOESS OF A PORTION OF THE NORTHERN-CENTRAL BASIN OF IOWA.

BY CLEMENT L. WEBSTER.

THE region under consideration may include Floyd county, and portions of Cerro Gordo, Worth, Mitchell, Chickasaw, Bremer, Butler, and Black Hawk counties. The general topography of this region is that of a gently undulating prairie country, with often a more or less broken surface along the course of the streams. Portions of Worth, Chickasaw and Bremer counties are low and rather wet, while that of other portions of the area are dryer and more rolling. The western portion of this region is drained mainly by Flood and Lime creeks and the Shellrock river, while the eastern portion is drained by the Cedar and Wapsipinecan rivers and their affluents.

All the streams of the area have a general northwest and southeast trend; their initial direction having been predetermined by the general dip of the subjacent rock strata. The Shellrock and Lime creeks have, for the most part, in their course through this region, eroded their channels through the drift, and into the underlying Devonian strata to a depth varying from five to seventy feet. The Cedar has cut through the drift, and sunk into the underlying rocks to a depth of from ten feet to over one hundred feet. The Wapsipinecan river and Flood creek flow through this country mostly upon the drift formation. The valleys of the streams of this area are usually broad, with one side more or less well defined, while the opposite side gradually emerges into the adjoining upland.

By far the greater portion of the surface of the area is occupied by the drift formation, which varies much in thickness at different localities. The difference seems to be partially due to original deposition, and partially to subsequent erosion. A line drawn from Waterloo, in Black Hawk county, in a northwest direction to Mason City, in Cerro Gordo county, and another line drawn from Waterloo to Osage, in Mitchell county, would include within their boundary the area of the thinnest drift of the region, and, indeed, of Iowa. In all parts of this attenuated drift area, the underlying rock strata is exposed at the surface in very numerous places.

Present evidence seems to indicate that the superficial geological formation of this entire region shows two main Glacial epochs, each of which is characterized by several subdivisions. As belonging to the earlier Glacial epoch, there are recognized two drift sheets. Between these occur, at numerous points in the area, and other portions of the State, vegetal accumulations, indicating a non-glacial interval. This horizon is usually referred to as the "Old Forest Bed." The material of the lower and upper drift sheets is (so far as observed) essentially the same, being composed for the most part of a heavy, dark blue clay, containing a greater or less number of transported deangulated erratics and pebbles, numbers of them being in a partially decomposed condition. At some points the clay of these beds is distinctly stratified, and as readily separated into layers as ordinary limestone.

The vegetal accumulation which occupies a horizon between these drift sheets is composed of coniferous wood, branches and twigs, which is very often associated with ancient peat, and more or less mixed with the drift. In digging wells in this division, natural gas is often obtained,[1] this originating from the organic accumulation. Gathering evidence seems to demonstrate that the vegetal accumulation of this region, as well as that of some other places in the State, are referable to a single horizon.

[1] In an article on "The Geology of Johnson county, Iowa," which appeared in the May number of this Journal for 1888, mention was made, by the writer, of wells of this character in Linn county, Iowa.

As belonging to the later Glacial epoch, we recognize three divisions: the Upland, or (for the most part) unstratified drift; Valley, or stratified drift; and Loess. The Upland drift constitutes by far the greater bulk of the superficial covering of the region. Its material is mainly true till, with local deposits or pockets of coarse gravel and sand, which is sometimes slightly cemented together by calcareous cement, and large numbers of transported erratics. There also occur local deposits of stiff red clay; for example, near Floyd, Nora Springs, and Rockford, in Floyd county.

These deposits of clay are usually quite free from erratics, gravel or sand, has a soapy feel, and becomes very hard upon short exposure to the atmosphere. The gravel deposits of this division are not restricted to any definite horizon, but are irregularly distributed through it. The material is usually well rounded pebbles of several varieties of greenstone, quartz (much of it probably of Cretaceous origin), granite, Devonian limestone, jasper, etc. There also sometimes occur specimens of coal, native copper and iron,[1] as well as Devonian and Trenton fossils. Large numbers of deangulated granite and greenstone boulders, and more rarely those of quartz, are seen distributed over the surface and mixed with the till. The boulders vary in weight from two pounds to ten or twenty tons; of the latter, fine examples are observed near Portland, Osage, Nashua, and other places.

In some parts of the area, angular fragments of Cretaceous conglomerate are not uncommon in the drift. This material was probably derived, at least in part, from the southwest portion of Floyd county, where rocks of this age are known to occur in place.[2] The material of this division is usually unstratified, but at times it is observed to be obliquely and discordantly stratified at high points, distant from waterways.

The region of most numerous erratics is that of the eastern portion of the area. A strip of country from one-half to four miles in width is occupied by great numbers of boulders, mostly of granite and greenstone. This boulder line has been traced by us from a point about one mile northeast from Charles City, in Floyd county, to a little east of Waterloo, a distance of about fifty miles. Below this point we have not traced it; neither have personal observations of it been made beyond Charles City. It has been reported to me, however, that from Charles City the boulder line extends in an easterly direction to a point near Fort Atkinson, in Winneshiek county, and there turns and pursues a more northerly course. From Charles City this boulder line takes a general southeast course, passing about two miles east of Nashua, in Chickasaw county, where it attains its greatest observed width, four miles. From this point it assumes a somewhat more easterly direction, and gradually diminishes in width. At a point midway between Richland Centre and Frederica, it again turns and pursues a more southerly course to Waterloo; the direction corresponding in the main with the general trend of the Wapsipinecan and Cedar rivers. In some localities, for example, Richland Centre, Frederica, etc., breaks in this line occur, from one-fourth to one-half mile in extent, where the erratics are relatively rare, but which soon appear again in strong force.[1] An interesting and instructive feature of these boulders is, that they are all (so far as noticed) deangulated, smooth, and very hard, while large numbers of them are flattened and striated on one side by glacial action. This feature is shared in to no such extent by the erratics of other portions of the area. The second recognized division of the later Glacial epoch is the Valley, or stratified drift. Of the river valleys of this region, only one is known to contain true Valley drift; and this the valley of the Shellrock.

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[1] The occurrence of these ores, etc., in the drift of this region, was noted by the writer in a paper on "The Glacial Flow in Iowa," which appeared in the August number of this Journal for 1887.

[2] A description of this rock has been given by us in a paper on "A Description of the Rockford Shales of Iowa," which appears in Vol. VI. of the Proceedings of the Davenport Academy of Science.

Although at different places along the course of some of the streams, local deposits of more or less distinctly stratified drift occur, still, as a rule, this feature is no more pronounced than at some points in the Upland drift. The Shellrock heads near Lake Albert Lea, Minnesota, and flows into this sheet of water at its upper extremity, and makes its exit at its lower or southern extremity. This sheet of water occupies a depression in the Inter-lobular moraine which enters Iowa. The Shellrock flows upon this heterogeneous drift accumulation for a distance of ten miles, and in reality does not reach the subjacent rock strata (except at two or three points) until Plymouth, in Cerro Gordo county, Iowa, is reached. From this point to its confluence with the Cedar, fifty-seven miles below, it has eroded its channel down through the drift formation, and flows upon the underlying Devonian strata.

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[1] Owing to the lack of other rock here for building purposes, the boulders are extensively used for underpinning, well and cellar walls, bridge piers, etc., for which they answer a most excellent purpose.

Stretching away from the morainic border, and partially filling the valley of the Shellrock, is a train of Valley drift, which extends to the confluence of this stream with the Cedar, seventy-two miles below. This morainic border lies upon rolling country, and there leads away from it, in portions of Cerro Gordo and Worth counties, valleys or trough-shaped depressions of notable size, which we should naturally expect would have drawn very considerable drainage floods from the margin of the ice. The material of this formation is usually well rounded, coarse and fine gravel and silicious sand, not essentially differing from the Upland drift gravel, except that it contains a very much larger percentage of silicious sand, and does not usually contain any perceptible admixture of clay. The material (except the very coarse portion) is everywhere obliquely and discordantly stratified. This feature is well illustrated in the following sections.

FIG. 1.

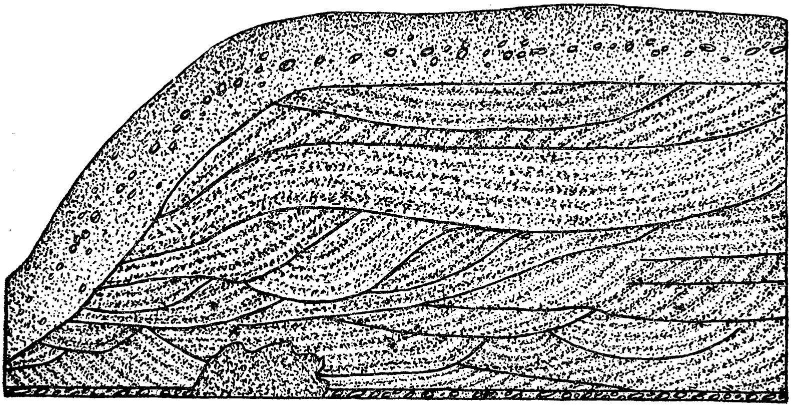

Fig. 1 represents a section of Valley drift at Rockford, illustrating the flow and plunge style of stratification. The material is mostly fine silicious sand, with a layer of coarse rounded gravel at the bottom, resting upon Devonian strata. The upper bed is a fine silt-like soil, mixed with coarse drift gravel, due in part to secondary accumulation arising from wash from a slight adjoining slope. The talus of sand at the base conceals several subordinate beds.

FIG. 2.

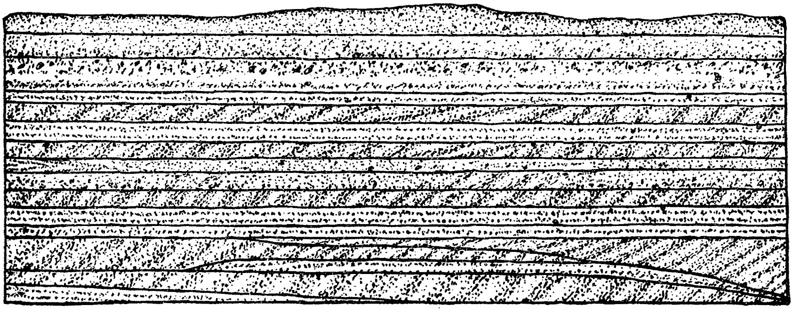

Fig. 2 represents a section of Valley drift near Nora Springs, illustrating oblique stratification. The material is well rounded gravel and sand. The upper bed is a black homogeneous silt, containing a few small drift pebbles. The second bed is a yellow clayey soil, with some fine gravel in the lower portion.[1] The next succeeding bed is partially stratified gravel and sand. The wave-like parts of Figure 1 correspond to succeeding plunges in the rapidly flowing waters, and indicates a much more turbulent condition of the water than when the material of Figure 2 was deposited.

At Clarksville, in Butler county, and other places, the Valley drift is seen to be obliquely stratified, the same as near Nora Springs. The gravel of this division at different points has been more or less solidified by calcareous cement. An interesting feature of this formation is that very often a large percentage of the finer material occupies the lowest position, while the coarser material often occupies the higher position.

Fine examples of terraces are observed along the streams of this region; for example, on the west side of the Cedar, a few miles above Waverly; on the west side of the Shellrock, two and one-half miles northwest from Rockford; on the east and west sides of Linn creek, one and one-half miles west of Rockford, and other places. These terraces appear to have been formed by the contracting and deepening of the channels of these streams by their own waters.

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[1] These beds well illustrate the condition of the first few feet of the superficial accumulation of nearly all parts of the area under consideration.

The last recognized division of the later Glacial epoch is the Loess formation. This formation is represented by only a few limited outliers at different points along the course of the Cedar river. On the west side of the Cedar, at Mitchell, in Mitchell county, is a local deposit of very fine and homogeneous, typical yellow loess, having a thickness of twelve feet. This rests directly upon a layer (from four to six inches in thickness) of clean rounded and angular drift pebbles, and the pebbles in turn rest (in places) upon a very dark, ferruginous layer of rock, which lays upon broken-up Devonian limestone below.

In the lower portion of the exposure of loess, one or two large shells was found, which were, however, in a too imperfect state of preservation for satisfactory determination. On the east side of the Cedar, one mile above Floyd, another outlier of this formation occurs. The loess at this place is like that observed at Mitchell, except that it contains small quantities of silicious sand in places, and in places has a very slight blueish-gray shade. The greatest observed thickness of this exposure was, by estimate, twenty-one feet. No drift was seen to intervene between the loess and the coarse-grained calcareo-silicious sandstone below.[1] The surface of the rock at this place rises to a height of over one hundred feet above the water in the Cedar.

The locality where this formation is next observed is on the same stream, at Waverley, about thirty-two miles below Floyd. The loess here (so far as ascertained) is light yellow, fine-grained and homogeneous, but contains at one point a very large amount of dark, grayish-brown silicious sand. No fossils, concretions, or ferruginous tubules was noticed in the loess of this place.

Probably no department of geological investigation has greater need of careful criticism than that which deals with the complex deposits of the Glacial period. Nowhere, perhaps, is there need of closer examination, and nowhere, probably, is the discrimination more difficult than in drawing the line between the earlier Glacial epoch and the later Glacial epoch of the area which has been under consideration.

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[1] This sandstone attains a thickness of two feet, and rests upon very hard and fine-grained, grayish-white Devonian limestone. No sandstone exactly like this is known to occur at any other point in northern Iowa.

HISTORY OF GARDEN VEGETABLES.

BY E. LEWIS STURTEVANT, M.D.

(Continued from page 808.)

Kohl-rabi. *Brassica oleracea caulo-rapa,* D C.

I FIND no certain identification of this race in the ancient writings. The *bunidia* of Pliny[1] seems rather to be the ruta baga, as he says it is between a *radish* and a *rape.* The *goggulis* of Theophrastus[2] and Galen[3] seems also to be the rutabaga, for Galen says the root contained *within* the earth is hard, unless cooked. In 1558 Matthiolus[4] speaks of the kohl-rabi as having lately came into Germany from Italy. Between 1573 and 1575 Rauwolf[5] saw it in the gardens of Tripoli and Aleppo. Lobel[6] in 1570, Camerarius[7] in 1586, Dalechamp[8] in 1587, and other of the older botanists, all figure or describe it as under European culture. This plant, in the view of some writers, is a cross between the cabbage and the rape, and many of the names applied to it convey this idea. This view is probably a mistaken one, as the plant in its sportings under culture tends to the form of the marrow cabbage, from which it is probably a derivation. In 1884, in two plants in pots in the

[1] Pliny. Lib. xx., c. 2.
[2] Theophrastus. Lib. vii., c. 4.
[3] Galen. De Alim.
[4] Matthiolus Comm., 1558, 248.
[5] Gronovius. Orient., 81.
[6] Pena and Lobel. Adv., 1570, 92.
[7] Camerarius. Epit., 1586, 251.
[8] Hist. Gen. Lugd., 1587, 522.